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ABSTRACT

Three instructional conditions which varied in the extent to which they emphasized direct instruction on word meanings were compared as to their effects on two aspects of reading comprehension: recalling word meanings and recalling facts from a story. The instructional conditions consisted of (1) meanings from context, which required students to infer word meanings from passage context, (2) meanings given, in which students were told meanings of key words as they read, and (3) meanings practiced, in which students practiced reciting word meanings before they read a story. The six learning-disabled students who participated in the study underwent each treatment on three separate occasions. Only the meanings-practiced condition consistently and significantly increased acquisition and retention of word meanings. Although the treatments were differentially effective in improving word knowledge, they surprisingly did not differentially influence students' ability to recall story facts. Results are discussed in regard to their implications, both for remedial reading instruction and for analyses of relationships between reading comprehension subskills. (Author)

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CENTER FOR THE STUDY OF READING*

Technical Report No. 25

LEARNING WORD MEANINGS A COMPARISON OF INSTRUCTIONAL PROCEDURES AND EFFECTS ON MEASURES OF READING COMPREHENSION WITH LEARNING DISABLED STUDENTS

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Learning Word Meanings:
A Comparison of Instructional Procedures and Effects on Measures of Reading Comprehension with Learning Disabled Students [1]

An analysis of the skills required for a person to derive and construct meaning from text discloses the importance of word recognition subskills (Engelmann, 1969). Yet, clinical experience with disabled readers as well as reflections upon one's own reading behavior suggests that word recognition alone is not a condition which guarantees adequate reading comprehension. Exactly what other skills a person must possess in order to comprehend written discourse, the relationships among these skills, and the instructional procedures which effect their mastery all remain in question.

Speculations as to what skills contribute to reading comprehension have been plentiful, and have led to the construction of a number of skill taxonomies which have been used largely for instructional purposes (Barrett, 1968; Cleland, 1965). In contrast, relatively few efforts and even less progress have been made in validating the skills identified in these taxonomies. Davis (1944, 1968) has attempted the most comprehensive empirical research to identify and confirm the existence of specific reading comprehension subskills.

Davis summarized comprehension skills identified by contemporary reading authorities. Included were such skills as recalling word meanings, selecting appropriate meanings for a word or phrase in context, following the organization of a passage, selecting the main

thought of a passage, answering questions that are specifically answered in a passage, drawing inferences about a passage from its content, recognizing literary devices used in a passage and determining tone and mood, and determining a writer's purpose, intent, and point of view (Davis, 1944). A factor analysis of performance on items designed to measure each of these subskills indicated that knowledge of word meanings was the single largest contributor to all other comprehension subskills. Davis (1944) concluded that the most important reading comprehension factors could be interpreted as memory for word meanings and reasoning in reading. A later replication of that research by Davis (1968) as well as subsequent re-analyses by Thorndike (Note 1) and Spearritt (1972) confirmed that knowledge of word meanings was clearly a unique, identifiable skill. While there is less consensus on the identification of other reading comprehension subskills, there does seem to be some agreement on the importance of knowledge of word meanings to reading comprehension. Whether one looks upon reading comprehension as a distinct skill area or an area directly tied to language skills (Sticht, Beck, Hauke, Kleiman & James, Note 2) knowledge of individual word meanings plays an important role.

Past vocabulary research has been largely directed at providing evidence that word meanings can be taught directly (Jenkins & Pany, Note 3; Petty, Herold, & Stoll, 1968). Among the strategies shown to be effective in teaching word meanings are: discussing unfamiliar word meanings prior to reading (Gray & Holmes, 1938: Serra, 1953), dictionary work (Serra, 1953), using defined words in sentences (Nelson, 1961; Anderson & Kulhavy, 1972), studying word parts

(Otterman, 1955), developing and expanding vocabulary through classroom experiences and visual aids such as films or field trips (Davis, 1951; McCullough, 1969; Lieberman, Note 4), and making use of context clues (Eicholz & Barbe, 1961; Wittrock, Marks, & Doctorow, 1975). The effectiveness of a commercially prepared vocabulary development kit was demonstrated by Jackson & Dizney (1963).

While this research provides evidence that word meanings can be taught, the relative effectiveness of different instructional strategies on acquisition of word meanings has been largely ignored (Petty, Herold, & Stoll, 1968). More importantly, most researchers have failed to investigate or establish the relationship of word knowledge to collateral measures of reading comprehension. The following research suggestions from the Literature of Research in Reading (Davis, 1971) reported to MacGinitie (1975) reflect a need for research to fill those gaps.

> "Presumably, the next steps [in developing systematic exercises to increase vocabulary in the teaching of reading] would be (1) to determine experimentally the types of learning exercises that are most efficient for increasing vocabulary level . . .; and (2) to conduct controlled experiments to determine the effect on pupils' reading of using such exercises systematically" (Davis, 1972 p. 644).

> "Controlled experiments should be conducted to determine the effect on comprehension ... produced by teaching the operational skills that represent five or more of the abilities that have been shown to underlie comprehension ... The design of these experiments should be such as to permit estimates of the relative effectiveness of training in each separate skill on: (1) performance in that skill; and (2) performance in overall comprehension" (Davis, 1972, 674-75).

The present study was designed with two purposes: first, to determine the relative effectiveness and efficiency of three instructional procedures which teachers have employed to increase the number of word meanings a student learns, and second, to examine the effect on collateral measures of reading comprehension of increasing the student's knowledge of word meanings.

Three experimental conditions were devised which varied in the amount of direct instruction provided and, thus, the extent to which word meanings were emphasized during a reading lesson. One condition, Meanings from Context, provided no direct instruction, placing the least emphasis on word meanings. Even though direct instruction on word meanings was not permitted, it was assumed that students might acquire new word meanings from context clues during reading of a story which contained unfamiliar words. In a second condition, Meanings Given, more emphasis was placed on word meanings; the instructor told the student the meaning of pre-selected words as they occurred in the story. The third experimental condition, Meanings Practiced, contained the heaviest

emphasis on direct instruction of word meanings; the meanings of pre-selected words were presented and practiced via a flash card technique prior to reading a story which contained those words.

The three instructional conditions, which varied in emphasis on word meaning instruction, were anticipated to vary not only in their effectiveness in teaching word meanings but also in the extent to which they would influence passage comprehension as measured by factual recall. Practicing word meanings as compared to being told word meanings was expected to have greater effects on all measures, and both of these procedures were expected to be superior to learning word meanings through context clues alone. It was further hypothesized that performance on a factual comprehension measure based on stories containing the target words would reflect the success of the three word meaning instructional conditions.

While a method's effectiveness would be measured by the reading comprehension measures, relative efficiency would be gauged by the amount of instructional time involved, as well as the amount of teacher time required for materials preparation.

Method

Subjects and Setting

The subjects (N=6) were five fourth and fifth grade females and one fifth grade male, ages 9-11, all of whom were classified as learning disabled and were receiving instruction from a special education resource teacher. Scores on the Stanford Achievement Test, Paragraph Meaning,

indicated subjects' reading comprehension ranged from 1.5 to 2.5 years below grade level. The Economy Keys to Reading (Economy, 1972) program was used in both the classrooms and resource room. All subjects had been placed in the fourth grade level texts based on results of a criterion-referenced, curriculum-based assessment. The median oral reading rate for stories used in this research was 70 correct words per minute (range: 55-95 median correct words per minute). Instruction in the resource room was on a one-to-one basis, with each of these students reading orally from the fourth grade book to the resource teacher or to a special education practicum student for approximately 20 minutes daily. After reading, they answered factual comprehension questions that were drawn from the reading passages. This type of reading instruction had been occurring for five months prior to the study. The experiment took place in the resource room in the context of the daily reading lesson.

Selection of Vocabulary

Fifteen words whose meanings the experimenter thought might be unknown to the children were chosen from each of nine stories from the students' reader. Before reading a story, each subject was individually pre-tested on the meanings of the 15 pre-selected words. The pre-test consisted of a typed list of those words. The student was asked to read each word orally and to tell the instructor the meaning of the word. The instructor wrote the student's answer on a separate form. From the pre-test results six words were selected

for each student for each story. Priority was given to words which appeared in the glossary of the text and/or were judged to be potentially useful to the student.

Treatment Conditions

Meanings from Context Condition. In this condition no direct instruction was provided on meanings of any words in the story. Presumably word meanings could be acquired through context clues contained in the story.

Meanings Given Condition. During this treatment condition, the instructor told the student the meaning of the six words during oral reading of the story. When the child finished a sentence containing the target word, the instructor said, "In this sentence the word (occupation) means (job)." No further instruction in word meaning was given.

Meanings Practiced Condition. The meanings of the six words were taught for a minimum of three days before the students read the story that contained the words. On the first day, the instructor presented a 3x5 word card to the student and read from the back of the card the word meaning plus a sentence containing the word. For example, the instructor presented the printed word "occupation" and said. "Occupation:job. My father's occupation is teaching." The student was then asked to read the word and repeat the meaning only. If correct, s/he was praised. If s/he failed to repeat the meaning correctly, the instructor again presented only the word and definition. The procedure continued until the student correctly repeated the definition, after

which the next word was presented, until all six words had been practiced twice. The sentence examples occurred in the first series on Day 1, but not thereafter. This practice procedure was repeated for the three days preceding the day on which the story containing these words was read. On the day a story was read, the six words were again reviewed and practiced prior to reading. In cases where a story required more than one day to complete, the words continued to be reviewed and practiced once before that day's reading.

Design

Each subject served as his/her own control and participated under all three treatment conditions (Randomized Block-3 Design [Kirk,1968]). To reduce the effects of variability in story lengths and difficulty, six treatment sequences were randomly assigned to each student, assuring that over all subjects, each story received each treatment condition, and that results reflected treatment, not order, effects.

Dependent Measure and Reliability

The dependent measures of reading comprehension employed in this research are similar to those commonly found on standardized reading achievement tests: knowledge of word meanings and answers to questions about selected reading passages (Stanford Achievement Test, 1970; Metropolitan Achievement Test, 1970).

Since unaided recall (Kelley & Krey, 1934) most closely approximates the behavior involved in giving meaning to a word in a sentence during reading, one dependent comprehension measure, Isolated Vocabulary Test,

was an oral definition of the six previously unknown words which had been selected for each story. This measure was taken twice: once at the completion of a story and again three to eight weeks later as a measure of retention (Isolated Vocabulary Test--Delayed).

In consideration of the possibility that a student might know the meaning of a word in context yet be unable to produce a definition of that word in isolation, a second dependent comprehension measure involving word knowledge was developed, Vocabulary in Context Test. Six sentences were constructed, each of which contained one of the vocabulary words. For three of the items, the student was given four choices from which to select the correct meaning of the vocabulary word in the sentence. For the other three, the student was asked to supply a synonym or phrase which could be substituted for the identified word in that sentence. The test was administered immediately prior to any instructional intervention on word meanings and again after the completion of a story in which the six words appeared. Although this test was presented to the student in written form, the instructor read the items and recorded the student's responses.

The third dependent comprehension measure, Story Comprehension, Factual Recall Test, required the students to write brief answers to ten factual recall questions about each story. Four of the ten questions contained one of the six vocabulary words identified for that particular story.

Word definitions and answers to the vocabulary tests and the comprehension questions were checked by two independent scorers. A third scorer reconciled disagreements.

Results

A total score combining all three stories for each treatment condition was calculated for each student on each of the dependent measures (see Table 1). Thus, the mean score of 4.33 on the

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Insert Table 1 about here

Isolated Vocabulary Test - Immediate for the Meanings from Context condition was obtained first by summing each student's three scores on that measure, and then by computing the mean for all six students.

Four separate analyses of variances were performed on test results which measured the immediate and long-term treatment effects on learning word meanings and the effect on various measures of reading comprehension.

Isolated Vocabulary Test - Immediate

The analysis of variance on this measure of word meaning learning indicated a significant overall treatment effect, F (2,10) = 62.41, $p < .01$. Tukey's HSD multiple comparison test (Kirk, 1968) revealed that Meanings Practiced condition means were significantly different from both the Meanings from Context condition and the Meanings Given condition. Six of six subjects demonstrated superior performance on this measure for words presented in the Meanings Practiced condition. The mean of the Meanings from Context condition did not differ significantly from the Meanings Given condition, although

the latter mean was higher. An Omega-squared estimate indicated that the treatment effects accounted for 83% of the variance on this measure.

Isolated Vocabulary Test - Delayed

Analysis of variance again indicated significant treatment effects, F (2.10) = 69.09, $p < .01$, when students were retested on definitions after a period of three to eight weeks. Tukey multiple comparison tests revealed that mean scores for the Meanings Practiced condition were significantly different from the means of the other two conditions, which did not differ significantly from each other. Again, all six subjects' performance was superior under the Meanings Practiced condition. An Omega-squared estimate indicated that treatment accounted for 71% of the variance on this followup measure of word meanings.

Vocabulary in Context Test

For the Vocabulary in Context Test both pre- and post-test scores were considered in a repeated measures randomized block factorial design. Analysis of variance yielded significant test, F (1,25) = 65.41, $p < .01$, and treatment, F (2,25) = 16.74, $p < .01$, as well as an interaction of test with treatment, F (2,25) = 15.43, $p < .01$. Accordingly an analysis of variance of simple main effects was performed. The change in mean scores from pre- to post-test measures under the Meanings from Context condition was not significant, F (1,25) = 1.96, N.S. However, differences between pre- and

post-test means were significant for both the Meanings Given condition, F (1,25) = 12.81, $p < .01$, and the Meanings Practiced condition, F (1,25) = 81.50, $p < .01$. Tukey's HSD multiple comparison test was performed to compare differing treatment effects on the Vocabulary in Context post-test. Scores from the Meanings Practiced condition were significantly higher than either Meanings Given or Meanings from Context scores, with all subjects achieving highest scores on words from the Meanings Practiced condition.

The Vocabulary in Context Test was a mixture of two types of test items: multiple choice for which students identified the correct synonum for target words in sentences, and synonym substitution for which students supplied synonyms for target words in sentences. To determine if there were differences in scores related to question type, two analyses of variance were performed separately for the multiple choice and synonym substitution items. Results of both analyses paralleled those of the analysis of variance for all items combined in the Vocabulary in Context Test. There were significant changes for Meanings Given and Meanings Practiced scores from pre- to post-test, and the Meanings Practiced scores consistently were significantly higher than the other two conditions.

Story Comprehension, Factual REcall Test

Analyses of variance on the Factual Recall Test revealed no effects due to treatment either when all items were examined, F (5, 10) < 1.0, or when only the four items which contained one of the vocabulary words were examined, F (5,10) < 1.0.

Figure 1 illustrates the pattern of effects on the dependent measures when scores are examined according to the three successive exposures to each of the treatment conditions. The superiority of

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Insert Figure 1 about here

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the Meanings Practiced condition on the two vocabulary measures is evident. Similarly, the failure of the three treatments to differentially influence factual recall is also clear. Figure 1 specifically indicates that treatment effects after each exposure to a treatment were consistent with the reported results of overall treatment effects.

Discussion

One purpose of this study was to compare the relative effectiveness and efficiency of three methods of vocabulary instruction. Results indicated that as emphasis on direct instruction of word definitions increased so did performance on vocabulary measures.

Stating Meanings for Isolated Words

Repeated practice by a flash card technique was consistently more effective than either telling a student the meanings of words or relying on story context to teach word meanings. As is plain from Figure 1, the Meanings Practiced condition produced higher performance than the other conditions each time they were compared.

It is interesting to note that some students appeared to acquire word meanings under the Meanings from Context condition. However, the study was not designed to control for regression effects. Students' performance on the pre-test may have underestimated their actual knowledge of word meanings; higher posttest scores in the Meanings from Context condition, then, could have been a result of this regression effect rather than a result of acquiring word meanings. A partial test for each regression effects was performed for one student. The Isolated Vocabulary Test - Immediate was given twice to this student, each test separated by at least one week. Between the tests the student did not read a story containing the vocabulary words. For this student there was no change in performance between the two measures; she obtained scores of zero each time. On one occasion, however, that same student was able to provide a correct word meaning following the Context condition intervention. Thus, context rather than regression effects may have accounted for non-zero scores on the post-tests in the Meanings from Context condition. This possibility should be addressed more systematically in future research.

The Isolated Vocabulary Test - Delayed was administered to assess differing effects of treatments on retention of acquired vocabulary meanings. Although under no condition did students remember all of the newly acquired word meanings, the Meanings Practiced condition method again was most effective in facilitating retention of a greater number of words (73%).

Recognizing and Giving Synonyms for Target Words in Sentences

Besides requiring students to state meanings for isolated words, acquisition of meanings was measured a second way. This second vocabulary measure, the Vocabulary in Context Test, differed from the first in that students were asked either to recognize or to state a synonym for a target word as it appeared in a sentence. This measure was constructed because it was thought that it might be a more sensitive measure of word knowledge. In fact, pre-test scores on this measure indicated that students were more likely to recognize a correct synonym, and to a lesser degree, supply a correct synonym or synonym phrase for target words that they were unable to define in isolation.

On this measure, both the Meanings Given and Meanings Practiced conditions were superior to the Meanings from Context condition in that they both showed significant differences between pre- and post-test scores. Statistical tests on the treatment effects on the post-test alone showed that scores from the Meanings Practiced condition were significantly higher than either of the other two conditions. Separate analyses of variance of multiple choice items and synonym-substitution items on the post-test of the Vocabulary in Context Text indicated parallel results.

Answering Factual Recall Questions

A second intent of this study was to investigate the relationship between increased word knowledge and a factual measure of reading comprehension. While comprehension measures related to knowledge of word meanings reflected the varying instructional emphases on teaching

word meanings, there were no significant treatment effects on factual recall comprehension scores. Thus, learning the meanings of unfamiliar words in a story did not appear to improve story comprehension, even on the questions using the words targeted for meaning instruction.

A number of factors might be considered in explaining the apparent non-effects of increased knowledge of word meanings on reading comprehension as measured via factual recall. By asking questions about a story after it is read, performance may be more a function of story memory rather than story understanding. In an analysis of reading comprehension scores on a test composed of vocabulary, syntax, item sequence, and item recall scores, Rystrom (1970) reported that the single best predictor of total reading comprehension scores was memory. Perhaps if in the present experiment, comprehension has been assessed with a procedure less reliant on memory, the effects of word knowledge would have emerged. Nevertheless, it is rather surprising that word knowledge did not appear to affect the ability to recall facts about the story. Factual recall averaged between 64% and 69% regardless of instruction in word meanings (see Figure 1).

The apparent non-effect of increased word knowledge on certain comprehension measures may also be related to the nature of the instructional procedures, which tended to emphasize definition.

Cronbach (1942) warned that although children may verbalize a rote definition, they may still lack an adequate understanding of the particular concept. Even though the present experimenters were careful to define the target words using very basic vocabulary, and provided a sample sentence using the word, this procedure may not have been sufficient to guarantee a functional understanding of the concepts taught. Thus, reading comprehension was not affected because the students were still unable to use their vocabulary knowledge while reading.

Perhaps teaching word meanings is only one step in teaching comprehension; disabled readers may also require training to integrate individual word meanings within sentences and then to relate meanings of several sentences contained in a passage (Otto, Note 5; Chapman, 1973). Unless a training sequence includes all of those skills, a student's understanding of a passage may not be appreciably improved.

Another variable which might alter the effect of word knowledge on story comprehension is the density of unknown words per story. Jackson and Dizney (1963) who also report a lack of effects of increased word knowledge on reading comprehension, as measured by a standardized reading comprehension test, speculate that a large quantity of word meanings must be taught before a general overall effect will be noticed. In the present experiemnt, only six word meanings were taught for each story. If this represents only a small

per cent of words in a story that a student did not know, the effect of learning those words may not have been sufficient to offset the effects of a large number of unknown words.

Relative efficiency of the three methods

In considering the comparative efficiency of the three methods, the Meanings from Context condition is obviously most efficient since it requires neither materials preparation nor instruction time. However, this method is also the least effective in terms of affecting word knowledge.

Both the Meanings Given and Meanings Practiced methods required a small amount of daily instructional time. For each student, records indicated that daily instructional time for flash card drill on six words averaged about two minutes. While precise daily records were not kept for the amount of instructional time consumed by telling word meanings during reading, an estimate based on several observations suggests that this procedure required approximately 10 seconds per word or one minute per six words. While the flash card drill takes more instructional time (approximately six minutes per story versus one minute), and more time for preparation of flash cards, the number of word meanings learned and retained is substantially larger, by approximately a factor of three. Thus, repeated flash card practice of word meanings seems to be worth the investment of instructional time, particularly in light of the per cent of word meanings retained as well as the number of word meanings learned.

The results of the present study suggest that as direct instruction of word meanings increases, so does students' acquisition of word knowledge. Relying on context, or on telling meanings to teach word meanings is unmistakably inferior to practice in stating meanings.

Additional research is clearly needed on the contribution of word meaning to reading comprehension. The results reported here fail to support the teaching of word meanings to improve story understanding, at least as it is measured by factual recall. This does not necessarily indicate that knowledge of word meanings is unimportant for story comprehension. As mentioned earlier, either improved instructional procedures or selection of more sensitive comprehension measures may be required to ascertain word meaning effects on comprehension. On the other hand, the non-effects reported here stand as a challenge to one explanation for reading comprehension failure. Specifically, an explanation which singularly attributes poor comprehension to the reader's lack of word knowledge must be carefully examined. The results of the present investigation without doubt emphasize the importance of future research on teaching methodologies not only to determine relative effects on specific skills, such as acquiring word meanings, but also on presumably collateral skills, such as story comprehension.

In regard to instructional practice, the findings of this study may be seen as informative for special education resource teachers and, for that matter, for any reading teachers who provide oral

reading instruction. During a reading lesson, it is common practice for teachers to supply word meanings for unfamiliar words that the child encounters. Presumably, this practice is occasioned by the belief that telling children the meanings of unfamiliar words will help them acquire the word meanings, or that at least it will help them better comprehend the reading passage. The results of the present study fail to support these assumptions; telling children word meanings had limited impact on acquisition of word meanings and failed to affect story comprehension, as measured by factual recall. While these results need to be replicated in subsequent investigations, for the present, they raise some interesting questions about common practices in reading instruction.

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Footnote

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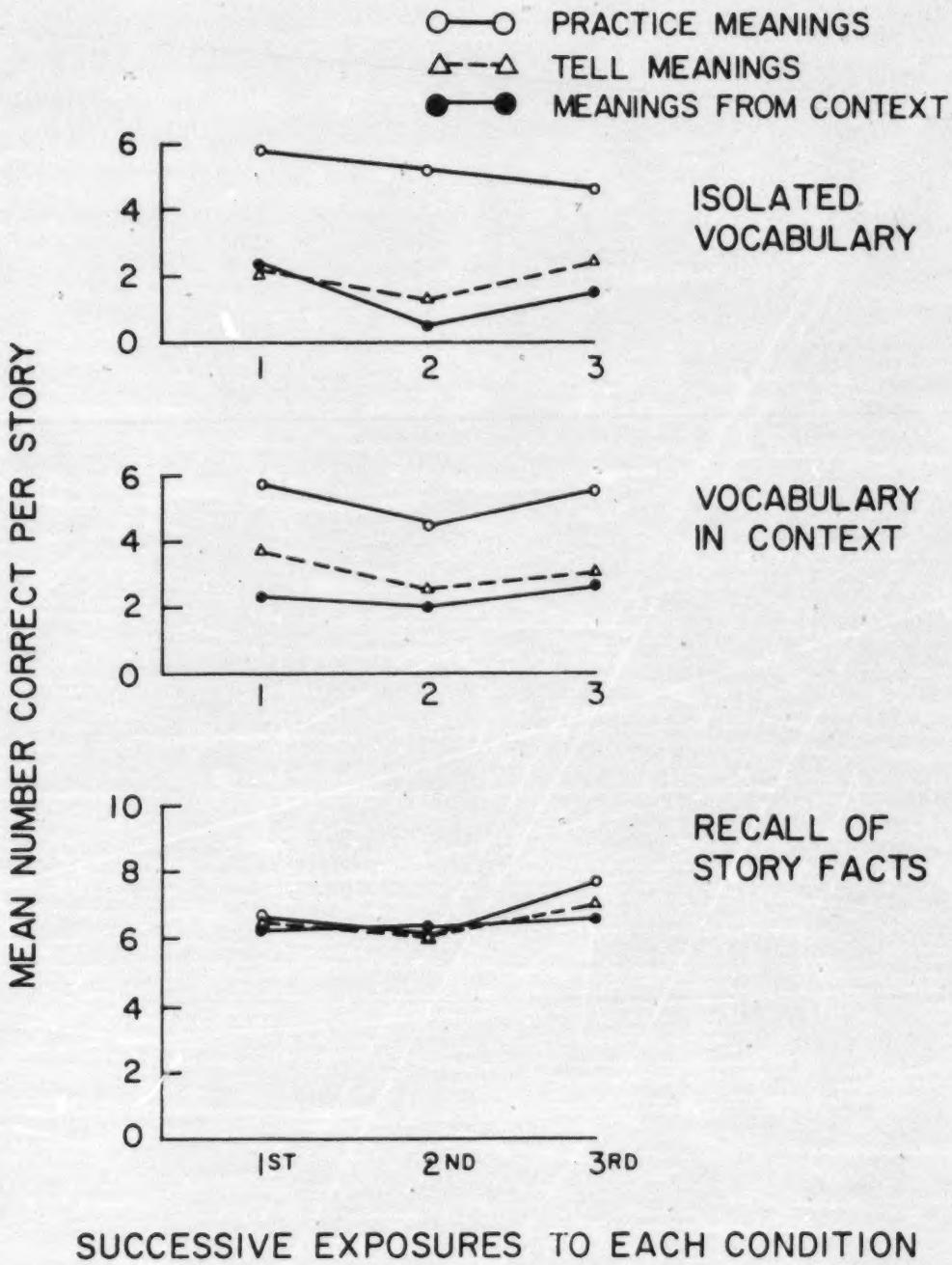
Table 1

Means and Standard Deviations for the Number Correct on each Dependent Variable Under each Treatment Condition

	Meanings from context		Meanings Given		Meanings Practiced	
	Mean	S.D.	Mean	S.D.	Mean	S.D.
Isolated Vocabulary-Immediate (possible correct: 0-18)	4.33	2.33	5.67	2.58	15.67	2.07
Isolated Vocabulary-Delayed (possible correct: 0-18)	3.00	1.55	3.67	2.34	11.67	3.20
Factual Recall (possible correct: 0-30)	19.17	3.37	19.67	3.78	20.67	3.67
	Pre		Pre		Pre	
Vocabulary in Context (possible correct: 0-18)	5.83	2.88	5.33	2.94	5.83	3.44
	Post		Post		Post	
	7.33	2.16	9.17	2.13	15.50	1.38

Figure Caption

Figure 1. Mean scores per treatment by order of presentation.


PRACTICE MEANINGS
TELL MEANINGS
MEANINGS FROM CONTEXT
ISOLATED VOCABULARY
VOCABULARY IN CONTEXT
RECALL OF STORY FACTS
MEAN NUMBER CORRECT PER STORY
6
4
2
0
1
2
3
10
8
6
4
2
0
1ST
2ND
3RD
SUCCESSIVE EXPOSURES TO EACH CONDITION

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